



eduresourceza.com

EXAMINATION PAPER 1: MECHANICS

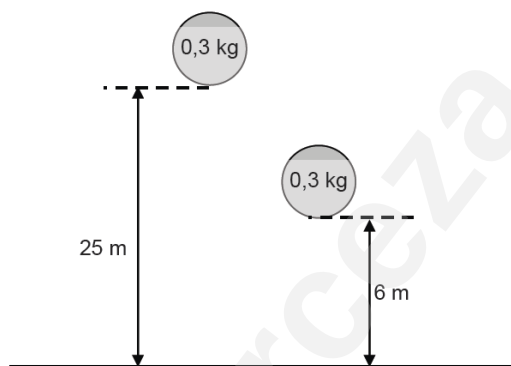
Learner Note: In graphs and equations of motion, it is critical to understand the importance of the sign + or – for displacement, velocity and acceleration.

SECTION A: TYPICAL EXAM QUESTIONS

Question 1: 15 minutes (Taken from the DoE Physical Sciences Feb-March Paper 2009)

The roof of a tall building is 25 m above the ground. A rigid ball of mass 0,3 kg falls freely when dropped from the roof. It strikes the concrete floor on the ground with velocity v_1 . It bounces to a maximum vertical height of 6m..

The ball was in contact with the floor for 0,9 s. Ignore the effects of friction.

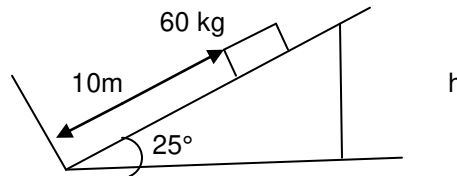


- 1.1 Calculate the velocity, v_1 , when the ball first hits the floor. (3)
- 1.2 Calculate the impulse of the ball as a result of the collision. (7)
- 1.3 Calculate the magnitude of the net force exerted on the ball. (3)
- 1.4 Using the ground as zero reference, draw a sketch graph of position (displacement) versus time for the motion of the ball from its original height until it reaches its second maximum height. Indicate the relevant position values on the y-axis. (4)
- 1.5 The rigid ball is now replaced with a softer ball of the same mass and volume as the rigid ball. It is then dropped from the same height onto the concrete floor. Will the ball reach the SAME, GREATER or LESSER height compared to the previous ball? Use principles of physics to explain your answer. (3)

[20]

Question 2: 15 minutes (Taken from the DoE Physical Sciences Feb – March Paper 1 2010)

A box of mass 60 kg starts from rest at height h and slides down a rough slope of length 10 m, which makes an angle of 25° with the horizontal. It undergoes a constant acceleration of magnitude $2 \text{ m} \cdot \text{s}^{-2}$ while sliding down the slope.



- 2.1 State the work-energy theorem in words. (2)
- 2.2 Draw a free body diagram showing all the forces acting on the cardboard box while it slides down the slope. (3)
- 2.3 The box reaches the bottom of the slope. Calculate the following:
 - 2.3.1 The kinetic energy of the box, using equations of motion. (5)
 - 2.3.2 The work done by the gravitational force on the box. (4)
 - 2.3.3 The work done on the box by the frictional force, using the work-energy theorem. (4)
 - 2.3.4 The magnitude of the frictional force acting on the box. (3)

[21]

SECTION B: SOLUTIONS AND HINTS TO SESSION 33 HOMEWORK

Question 1:

- | | | | |
|-----|---|-----|---|
| 1.1 | D | 1.5 | C |
| 1.2 | A | 1.6 | C |
| 1.3 | B | 1.7 | A |
| 1.4 | A | 1.8 | C |

Question 2:

- 2.1 It is a combustion reaction. ✓ ✓ (2)
- 2.2 It is a cell that generates electrical power quietly and efficiently without pollution.
It is a battery in which the reactants are continually fed to the electrodes. ✓ ✓ (2)
- 2.3 The oxygen ✓ ✓ (2)
- 2.4 $2\text{H}_2 + \text{O}_2 \leftrightarrow 2\text{H}_2\text{O}$ ✓ for balancing (4)

[10]